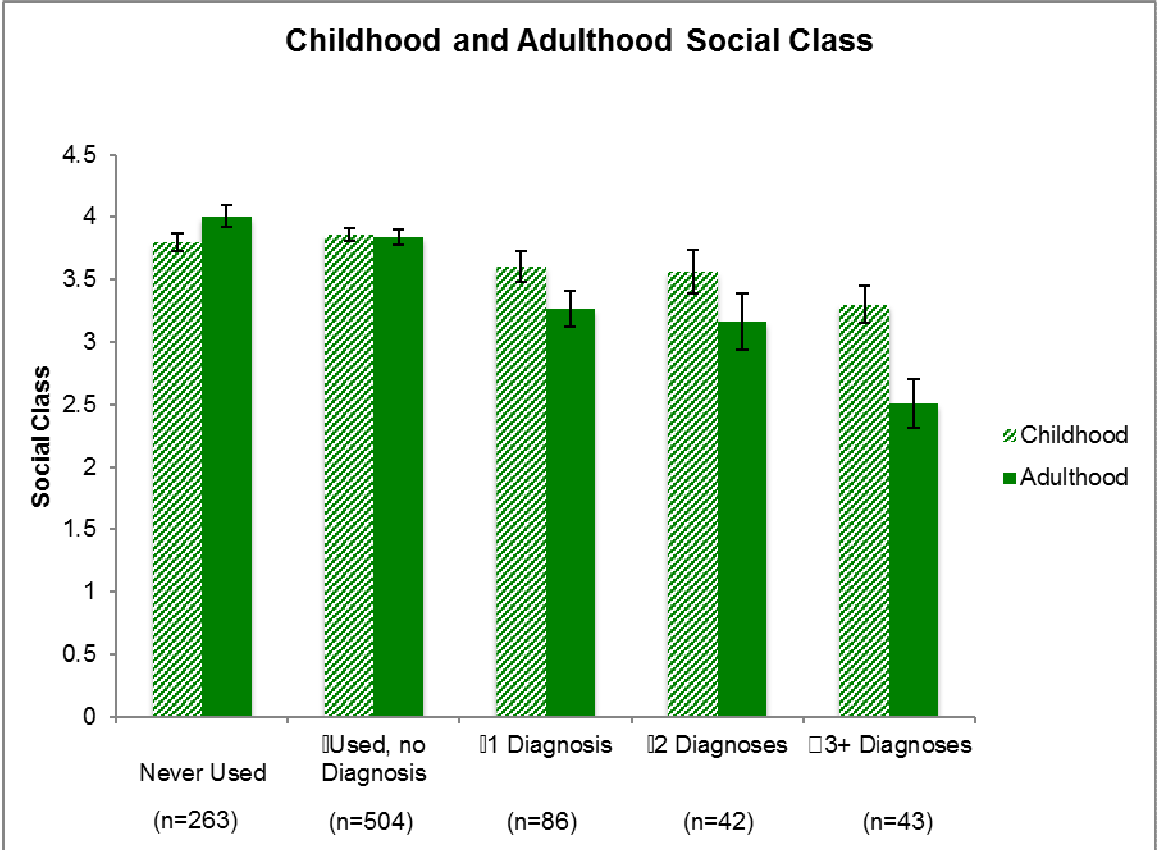


Figure S1. Study members with more persistent cannabis dependence exhibited larger social class decline than members with no dependence: Childhood and adulthood social class by persistence of cannabis dependence. (Error bars = SEs)¹



¹Estimates are observed means. In a model adjusting for sex, European ancestry, proportion of first-degree relatives with substance dependence, low childhood self-control, childhood IQ, and adolescent psychopathology (major depressive disorder and conduct disorder), Study members who were from lower childhood social class did not experience more persistent cannabis dependence in adulthood than members from higher childhood social classes ($b = -0.03$; S.E. = 0.03; $X^2 = 0.33$; $df = 1$; $p = 0.57$). In a model adjusting for sex, European ancestry, proportion of first-degree relatives with substance dependence, low childhood self-control, childhood IQ, adolescent psychopathology (major depressive disorder and conduct disorder), achievement orientation at age 18, living with partner or spouse at age 38, and number of children at age 38, Study members with more persistent cannabis dependence exhibited lower adult social class than members with no dependence ($b = -0.19$; S.E. = 0.05; $t = -3.92$; $p < 0.0001$).

Table S1. Brief Description of Control Variables¹

Variable	Description	Association with cannabis dependence	Association with outcomes
Sex	Male or female.	Males were more likely to have more persistent cannabis dependence ($X^2 = 42.97$; degrees of freedom (df) = 1; $p < 0.0001$).	Males experienced more downward mobility ($t = -4.04$; $p < 0.0001$); more antisocial behavior in the workplace ($t = 4.18$; $p < 0.0001$); and were more likely to have had at least one traffic conviction ($X^2 = 11.82$; $df = 1$; $p = 0.0006$) than females.
European ancestry	Self-reported ethnicity, measured as the ethnicity of the study members' grandparents. 61 Study members had at least 2 non-European grandparents.	Study members of non-European descent were more likely to have more persistent cannabis dependence ($X^2 = 6.09$; $df = 1$; $p = 0.0136$).	Study members of European descent had less financial difficulties than Study members of non-European descent ($t = -3.47$; $p = 0.0005$).
Parental social class	The socioeconomic status of Study members' parents was measured with the Elley-Irving scale (Elley & Irving, 1976), the forerunner of the NZSEI-06, which assigned occupations into 1 of 6 SES groups (from 1 = unskilled laborer to 6 = professional). The higher of either parents' occupation was averaged spanning the period from Study members' birth to age 15 (1972-1987).	Parental socioeconomic status negatively associated with persistence of cannabis dependence ($X^2 = 4.49$; $df = 1$; $p = 0.034$).	Study members with higher parental socioeconomic status experienced more downward mobility ($t = -14.98$; $p < 0.0001$); had fewer financial difficulties ($t = -6.02$; $p < 0.0001$); less antisocial behavior in the workplace ($t = -3.59$; $p = 0.0003$); less relationship conflict ($t = -4.35$; $p < 0.0001$); and were less likely to have had at least one traffic conviction ($X^2 = 12.20$; $df = 1$; $p = 0.0005$).

Family history of substance dependence	Family histories were collected from study members (when they were age 30-33 years) and from their parents. Family psychiatric history data were collected about each study member's biological parents, grandparents, and siblings. Each participant's family history of substance use disorder was calculated as the % of family members with a positive history of disorder, taking into account genetic relatedness.(Milne et al., 2009)	A family history of substance dependence was associated with more persistent cannabis dependence ($X^2=56.37$; $df=1$; $p<0.0001$).	Study members with a greater proportion of family members with a positive history of substance dependence had more financial difficulties ($t=6.55$; $p<0.0001$); more antisocial behavior in the workplace ($t=4.28$; $p<0.0001$); more relationship conflict ($t=5.01$; $p<0.0001$); and were more likely to have at least one traffic conviction ($X^2=19.17$; $df=1$; $p<0.0001$).
Low self-control	Assessed using a multi-occasion/multi-informant strategy, across ages 3-11 years. Nine measures of childhood self-control in the composite include observational ratings of children's lack of control, parent and teacher reports of impulsive aggression, and parent, teacher, and self reports of hyperactivity, lack of persistence, inattention, and impulsivity.(Moffitt et al., 2011)	Low self-control was associated with more persistent cannabis dependence ($X^2=22.57$; $df=1$; $p<0.0001$).	Study members with lower self-control experienced more downward mobility ($t=-3.66$; $p=0.0003$); more financial difficulties ($t=8.56$; $p<0.0001$); exhibited more antisocial behavior in the workplace ($t=4.57$; $p<0.0001$); had more relationship conflict ($t=5.34$; $p<0.0001$); and were more likely to have had at least one traffic conviction ($X^2=40.22$; $df=1$; $p<0.0001$).
Childhood IQ	Assessed using the Wechsler Intelligence Scale for Children–Revised (WISC-R).(Wechsler, 1974) IQ scores for ages 7, 9 and 11 were averaged and standardized.	Childhood IQ was not associated with more persistent cannabis dependence ($X^2=0.26$; $df=1$; $p=0.61$).	Study members with higher childhood IQ experienced less downward mobility ($t=2.90$; $p=0.004$); had less financial difficulties ($t=-7.71$; $p<0.0001$); exhibited less antisocial behavior in the workplace ($t=-2.78$; $p=0.006$); less relationship conflict ($t=-3.99$; $p<0.0001$); were less likely to have had at least one traffic conviction ($X^2=22.85$; $df=1$; $p<0.0001$).

Childhood major depressive disorder and conduct disorder	Study members were assessed with the Diagnostic Interview Schedule for Children (DISC-C; Costello et al., 1982(Costello, Edelbrock, Kalas, Kessler, & Klaric, 1982)) at ages 11, 13, and 15 years.(Moffitt et al., 2011) 5.8% of the Study members met DSM-III (American Psychiatric Association, 1980) diagnostic criteria for depression and 17.4% met diagnostic criteria for conduct disorder.	Childhood depression ($X^2 = 10.80$; $df=1$; $p=0.001$); and conduct disorder ($X^2 = 85.93$; $df=1$; $p<0.0001$) associated with more persistent cannabis dependence.	Study members with childhood depression had more financial difficulties ($t=5.15$; $p<0.0001$); more antisocial behavior in the workplace ($t=2.01$; $p=0.045$); and relationship conflict ($t=3.33$; $p=0.0009$). Study members with childhood conduct disorder also had more financial difficulties ($t=7.22$; $p<0.0001$); more antisocial behavior in the workplace ($t=4.72$; $p<0.0001$); more relationship conflict ($t=5.18$; $p<0.0001$); and were more likely to have had at least one traffic conviction ($X^2=30.13$; $df=1$; $p<0.0001$).
Achievement orientation at age 18	Study members were assessed with the Achievement scale from the Multidimensional Personality Questionnaire.(Patrick, Curtin, & Tellegen, 2002) It measures the extent to which a person works hard, enjoys demanding projects and working longer hours.	Achievement orientation was not significantly associated with persistent cannabis persistence ($X^2 = 3.19$; $df = 1$; $p = 0.0742$).	Study members with higher levels of achievement orientation had fewer financial difficulties ($t = -2.57$; $p = 0.010$), and less antisocial behavior in the workplace ($t = -2.98$; $p = 0.003$), but more traffic convictions ($t = 6.66$; $p = 0.010$) than study members with lower levels of achievement orientation.
Partner/marital status	Whether or not the Study member is married or cohabiting.	Having a spouse ($X^2 = 43.35$; $df=1$; $p<0.0001$) was associated with less persistent cannabis dependence, while having a partner ($X^2 = 20.26$; $df=1$; $p<0.0001$) was associated with more persistent cannabis dependence.	Study members with a spouse experienced less downward mobility ($t=5.06$; $p<0.0001$); had fewer financial difficulties ($t=9.59$; $p<0.0001$); less antisocial behavior in the workplace ($t=-5.02$; $p<0.0001$); less relationship conflict ($t=-5.92$; $p<0.0001$); and were less likely to have received at least one traffic conviction ($X^2=20.18$; $df=1$; $p<0.0001$). Study members with a partner experienced less downward mobility ($t = -3.47$, $p = 0.0005$); had more financial difficulties ($t=2.76$; $p=0.006$) and more relationship conflict ($t = 3.07$; $p = 0.002$). Study members with more children had less downward mobility ($t=2.24$; $p=0.0255$); more financial difficulties ($t=4.39$; $p<0.0001$); more relationship conflict ($t=2.76$; $p=0.006$); and were more likely to have received at least one traffic conviction ($X^2=7.51$; $df=1$; $p=0.006$).
Number of children	Number of biological children.	Having more children was unrelated to more persistent cannabis dependence ($X^2=2.57$; $p=0.1089$).	

¹ All statistical tests were estimated with 1 degree of freedom

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Table S2. Heavy Persistent Cannabis Use is Associated With Midlife Economic and Social Problems (n=947) ¹

	Never used (n=266)		Used but never daily (n=541)		Used daily at 1 wave (n=50)		Used daily at 2 waves (n=41)		Used daily at 3+ waves (n=49)		Linear trend test ^{7,8}	<i>p</i>	Linear trend test ^{7,9}	<i>p</i>
	<i>Mean</i>	<i>(SE or 95% CI)</i>	<i>Mean</i>	<i>(SE or 95% CI)</i>	<i>Mean</i>	<i>(SE or 95% CI)</i>	<i>Mean</i>	<i>(SE or 95% CI)</i>	<i>Mean</i>	<i>(SE or 95% CI)</i>				
Social mobility ²	0.20	(0.09)	-0.01	(0.06)	-0.28	(0.21)	-0.50	(0.24)	-1.05	(0.21)	-5.13	<0.0001	-3.96	<0.0001
Financial difficulties ^{3,4}	-0.20	(0.06)	-0.07	(0.04)	0.39	(0.13)	0.79	(0.15)	0.83	(0.13)	9.48	<0.0001	5.70	<0.0001
Antisocial behavior in workplace ^{4,5}	-0.29	(0.07)	0.00	(0.05)	0.38	(0.15)	0.56	(0.19)	0.71	(0.16)	6.75	<0.0001	4.57	<0.0001
Relationship conflict ^{4,6}	-0.24	(0.06)	0.01	(0.04)	0.12	(0.15)	0.44	(0.17)	0.68	(0.15)	6.23	<0.0001	3.30	0.001
Traffic conviction (%) ³	0.3%	(0.0- 2.1%)	2.6%	(1.5- 4.7%)	7.2%	(2.5- 21.1%)	24.1%	(10.8- 53.4%)	14.5%	(6.2- 33.7%)	33.79	<0.0001	6.79	0.009

¹Mean z-scores and proportions are estimated from crude linear or logistic regression models.

²Change in social class, from childhood social class of origin to social class at age 38; not adjusted for parental socioeconomic status

³Adjusted also for % of months in New Zealand from ages 32 to 38, as some Study members lived outside New Zealand for spells during this time period

⁴Z-score

⁵Restricted to Study members currently employed (n=786)

⁶Restricted to Study members currently in a relationship (n=866)

⁷All statistical tests are t-tests with an independent variable (i.e. number of waves with daily cannabis use) coded 0-5 with *n-1* degrees of freedom, except for traffic convictions, where Wald chi-square tests with 1 degree of freedom are used. All tests are obtained from regression models.

⁸Adjusted for sex

⁹Adjusted for sex, European ancestry, parental socioeconomic status, proportion of first-degree relatives with substance dependence, low childhood self-control, childhood IQ, adolescent psychopathology (major depressive disorder and conduct disorder), achievement orientation at age 18, living with partner or spouse at age 38, and number of children at age 38.

Table S3. Linear trend denoting association between persistence of cannabis dependence and economic and social problems, among respondents who used cannabis (n=681)

	Adjusted for sex		Adjusted for all covariates ⁶	
	Linear trend test ⁵	<i>p</i>	Linear trend test ⁵	<i>p</i>
Social mobility ¹	-3.06	0.002	-2.20	0.03
Financial difficulties ²	9.39	<.0001	5.81	<.0001
Antisocial behavior in the workplace ³	5.60	<.0001	3.80	0.0002
Relationship conflict ⁴	5.90	<.0001	3.08	0.002
Traffic convictions ²	14.29	0.0002	0.91	0.34

¹ Change in social class from childhood to age 38; not adjusted for parental socioeconomic status

² Adjusted also for % of months in New Zealand from ages 32 to 38

³ Restricted to respondents who were currently or formerly employed (n=570)

⁴ Restricted also to Study members currently in a relationship (n=620)

⁵ All statistical tests are t-tests with an independent variable (i.e. number of waves with cannabis dependence) coded 0-5 with *n-1* degrees of freedom, except for traffic convictions, where Wald chi-square tests with 1 degree of freedom are used. All tests are obtained from regression models.

⁶ Adjusted for sex, European ancestry, parental socioeconomic status, proportion of first-degree relatives with substance dependence, low childhood self-control, childhood IQ, adolescent psychopathology (major depressive disorder and conduct disorder), achievement orientation at age 18, living with partner or spouse at age 38, and number of children at age 38.

Table S4. Tests of linear trend and departures from linearity in the relationship between levels of cannabis dependence and economic and social problems, estimated from a model including the full sample (n=947)¹

	Crude		Adjusted for sex		Adjusted for all covariates ⁶	
	F-value	p-value	F-value	p-value	F-value	p-value
Social class mobility²						
Linear Trend	18.85	< 0.0001	13.73	0.0002	7.74	0.0055
Quadratic & Cubic	0.09	0.9175	0.05	0.9489	0.20	0.8202
Financial assets³						
Linear Trend	81.07	< 0.0001	89.49	< 0.0001	33.96	< 0.0001
Quadratic & Cubic	2.91	0.0548	2.74	0.0653	0.67	0.5134
Antisocial workplace behavior⁴						
Linear Trend	48.38	< 0.001	41.31	< 0.0001	19.50	< 0.0001
Quadratic & Cubic	1.84	0.1602	1.99	0.1380	1.47	0.2296
Relationship conflict⁵						
Linear Trend	40.94	< 0.0001	40.02	< 0.0001	12.37	0.0005
Quadratic & Cubic	0.70	0.4965	0.71	0.4939	0.83	0.4369
Traffic³						
	X ² test	p-value	X ² test	p-value	X ² test	p-value
Linear Trend	18.20	< 0.0001	14.75	0.0001	2.80	0.0943
Quadratic & Cubic	9.14	0.0104	9.88	0.0071	8.69	0.0130

¹ Degrees of freedom for Linear Trend F tests were 1/(n-1); degrees of freedom for Quadratic and Cubic F tests were (2, n-1); degrees of freedom for X² tests were 1.

² Change in social class from childhood to age 38; not adjusted for parental socioeconomic status

³ Adjusted also for % of months in New Zealand from ages 32 to 38

⁴ Restricted to respondents who were currently or formerly employed (n=786)

⁵ Restricted also to Study members currently in a relationship (n=866)

⁶ Adjusted for sex, European ancestry, parental socioeconomic status, proportion of first-degree relatives with substance dependence, low childhood self-control, childhood IQ, adolescent psychopathology (major depressive disorder and conduct disorder), achievement orientation at age 18, living with partner or spouse at age 38, and number of children at age 38.

Table S5. Economic and Social Problems at Age 38, Given Persistence of Cannabis Dependence From Ages 18-38, and Co-Occurrence of Alcohol and Hard-Drug Dependence ¹

	No cannabis use		Cannabis use, no dependence		Dependence at one phase		Dependence at 2+ phases		Dependence at 3+ phases		Linear trend test ⁷	p
	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)		
Full sample												
Social mobility ²	0.12	(0.10)	-0.05	(0.07)	-0.06	(0.17)	-0.43	(0.25)	-0.56	(0.25)	-2.76	0.01
Financial difficulties ^{3,4}	-0.13	(0.06)	-0.06	(0.04)	0.28	(0.10)	0.47	(0.14)	0.67	(0.14)	5.93	<0.0001
Antisocial behavior in workplace ^{4,5}	-0.20	(0.07)	-0.02	(0.05)	0.22	(0.12)	0.68	(0.18)	0.48	(0.19)	4.98	<0.0001
Relationship conflict ^{4,6}	-0.17	(0.07)	-0.04	(0.05)	0.41	(0.12)	0.24	(0.18)	0.46	(0.17)	4.34	<0.0001
Traffic convictions ³	0.1%	(0.0, 1.1%)	0.7%	(0.3, 2.0%)	1.6%	(0.5, 5.5%)	3.5%	(0.9, 13.5%)	0.6%	(0.0, 3.7%)	3.35	0.07
Excluding those with persistent alcohol dependence												
	No cannabis use		Cannabis use, no dependence		Dependence at one phase		Dependence at 2+ phases		Dependence at 3+ phases			p
	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)		
Social mobility ²	0.13	(0.10)	-0.02	(0.07)	0.05	(0.19)	-0.46	(0.25)	-0.65	(0.31)	-2.56	0.01
Financial difficulties ^{3,4}	-0.14	(0.06)	-0.09	(0.04)	0.26	(0.11)	0.45	(0.15)	0.50	(0.18)	4.70	<.0001
Antisocial behavior in workplace ^{4,5}	-0.22	(0.07)	-0.07	(0.05)	0.16	(0.13)	0.56	(0.19)	0.59	(0.22)	4.82	<.0001
Relationship conflict ^{4,6}	-0.20	(0.06)	-0.09	(0.04)	0.37	(0.12)	0.21	(0.18)	0.32	(0.21)	3.78	0.0002
Traffic convictions ³	0.1%	(0.0, 1.1%)	0.7%	(0.2, 2.0%)	1.5%	(0.4, 5.8%)	4.4%	(1.1, 18.0%)	0.4%	(0.0, 3.8%)	4.34	0.04
Excluding those with persistent hard drug dependence												
	No cannabis use		Cannabis use, no dependence		Dependence at one phase		Dependence at 2+ phases		Dependence at 3+ phases			p
	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)	Mean	(SE or 95% CI)		
Social mobility ²	0.13	(0.10)	-0.03	(0.07)	0.01	(0.18)	-0.37	(0.26)	-0.40	(0.28)	-2.14	0.03
Financial difficulties ^{3,4}	-0.14	(0.06)	-0.08	(0.04)	0.24	(0.10)	0.50	(0.15)	0.51	(0.16)	5.15	<0.0001
Antisocial behavior in workplace ^{4,5}	-0.21	(0.07)	-0.02	(0.05)	0.22	(0.12)	0.52	(0.19)	0.48	(0.20)	4.61	<0.0001
Relationship	-0.18	(0.07)	-0.06	(0.04)	0.38	(0.12)	0.16	(0.18)	0.33	(0.19)	3.78	0.0002

conflict ^{4,6}												
Traffic convictions ³	0.1%	(0.0, 1.2%)	0.8%	(0.3, 2.0%)	1.6%	(0.5, 5.8%)	2.7%	(0.6, 11.6%)	1.1%	(0.2, 6.7%)	4.49	0.03

Excluding those with persistent alcohol or hard drug dependence

	No cannabis use		Cannabis use, no dependence		Dependence at one phase		Dependence at 2+ phases		Dependence at 3+ phases			
Social mobility ²	0.14	(0.10)	-0.01	(0.07)	0.14	(0.19)	-0.46	(0.28)	-0.50	(0.37)	-2.00	0.05
Financial difficulties ^{3,4}	-0.15	(0.06)	-0.11	(0.04)	0.23	(0.11)	0.49	(0.16)	0.25	(0.21)	3.95	<.0001
Antisocial behavior in workplace ^{4,5}	-0.22	(0.07)	-0.08	(0.05)	0.17	(0.13)	0.44	(0.19)	0.61	(0.24)	4.46	<.0001
Relationship conflict ^{4,6}	-0.20	(0.06)	-0.09	(0.04)	0.38	(0.12)	0.18	(0.19)	0.12	(0.24)	3.24	0.001
Traffic convictions ³	0.1%	(0.0, 1.2%)	0.7%	(0.3, 2.1%)	1.5%	(0.4, 6.1%)	3.3%	(0.7, 15.2%)	1.0%	(0.1, 9.3%)	5.46	0.02

¹Means, test-statistics and p-values are adjusted for sex, European ancestry, parental socioeconomic status, proportion of first-degree relatives with substance dependence, low childhood self-control, childhood IQ, adolescent psychopathology (major depressive disorder and conduct disorder), achievement orientation at age 18, living with partner or spouse at age 38, and number of children at age 38. Please note that sample sizes for this table are net of any missing observations on these covariates.

²Change in social class from childhood to age 38; not adjusted for parental socioeconomic status

³Adjusted also for % of months in New Zealand from ages 32 to 38

⁴Z-score (M=0; SD=1).

⁵Restricted to respondents who were currently or formerly employed (N = 711 for full sample; N= 671 excluding those with persistent alcohol dependence; N= 697 excluding those with persistent hard drug dependence; and N= 660 excluding those with persistent alcohol or hard drug dependence)

⁶Restricted also to Study members currently in a relationship (N = 775 for full sample; N= 734 excluding those with persistent alcohol dependence; N= 758 excluding those with persistent hard drug dependence; and N= 721 excluding those with persistent alcohol or hard drug dependence)

⁷All statistical tests are t-tests with an independent variable (i.e. number of waves with cannabis dependence) coded 0-5 and degrees of freedom $n-1$, except for traffic convictions, where Wald chi-square tests with 1 degree of freedom are used. All tests are obtained from regression models.

Table S6. Completion of a tertiary degree among Study members who completed secondary school, by level of cannabis dependence and use (n=807)

No cannabis use (n=235)		Cannabis use, no dependence (n=452)		Dependence at one phase (n=63)		Dependence at 2+ phases (n=35)		Dependence at 3+ phases (n=22)		Effect size	Linear trend test ^{1,2}	p	Linear trend test ^{1,3}	p
%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)					
39.6%	(33.3-46.1%)	35.0%	(30.6-39.6%)	20.6%	(11.5-32.7%)	17.1%	(6.6-33.7%)	13.6%	(2.9-34.9%)	0.2	12.52	0.0004	9.54	0.002
Never used (n=235)		Used but never daily (n=481)		Used daily at 1 wave (n=40)		Used daily at 2 waves (n=27)		Used daily at 3+ waves (n=24)		0.2	13.45	0.0002	8.17	0.004
39.6%	(33.3-46.1%)	34.3%	(30.1-38.7%)	22.5%	(10.8-38.5%)	14.8%	(4.2-33.7%)	8.3%	(1.0-27.0%)					

¹All statistical tests are Wald chi-square tests with 1 degree of freedom. All tests are obtained from regression models.

² Adjusted for sex

³Adjusted for sex, European ancestry, parental socioeconomic status, proportion of first-degree relatives with substance dependence, low childhood self-control, childhood IQ, adolescent psychopathology (major depressive disorder and conduct disorder), achievement orientation at age 18, living with partner or spouse at age 38, and number of children at age 38.

⁴Odds ratios can be used to calculate effect sizes, as $\ln(OR)/1.81$. Please recall that effect sizes can be interpreted as .1 = small, .3 =medium, and .5 = large.